REMARKS

Claims 1-19, 21-27 and 29-34 are pending in the present Application. There are no new amendments in the current response.

I. THE CLAIMS ARE PATENTABLE OVER THE CITED ART

A. Paragraph 2 Rejection of Claims 1-19, 21-27, and 29-34.

In paragraph 2 of the Office Action, claims 1-19, 21-27, and 29-34 (all pending claims) were rejected under 35 U.S.C. 103(a) as being assertedly unpatentable over a paper by G. A. Heyman et al. entitled "Some Considerations in Determining Oxides of Nitrogen in Stack Gases by Chemiluminescence Analyzer" ("Heyman Paper") in view of a paper by Yokoyama et al. entitled "Improved Method for Determination of Nitrogen Oxide Concentration in Exhaust Gases" ("Yokoyama Paper"), a paper by R.D. Jacquot et al. entitled "Qualification Testing of an Infrared Analyzer System for SO_2 and NO in Power Plant Stack Gas" ("Jacquot Paper"), Burrows, U.S. Patent No. 5,739,038 (Burrows Patent") and Yamaki et al., U.S. Patent No. 4,073,866 ("Yamaki Patent") or Hara et al, Japanese App. No. 53-37591 ("Hara Application"). The Applicants respectfully traverse this rejection.

1. Independent Claims 1, 12, 22 , 25, 32 and 33

   a. Claim 1

Independent claim 1 recites an emissions monitoring system comprising a sampling device; a chamber positioned adjacent the stack; means for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas; at least one sample gas line at least a portion of which is disposed in the chamber interior; and means for removing particulate matter from the sample gas. The system also comprises an NO_2 converter in the chamber interior downstream of the means for removing particulate matter, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas; means for removing water from the sample gas, the means for removing being disposed adjacent the chamber and being in fluid communication with the at least one sample gas line downstream of the chamber; and at least one analyzer downstream of the means for removing water, each of the at least one

analyzer being configured for determination of a concentration level of a constituent in the sample gas.

b. Claim 12

Independent claim 12 recites an emissions monitoring system comprising a sampling device; a chamber positioned adjacent the stack; means for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas; at least one sample gas line at least a portion of which is disposed in the chamber interior and means for removing particulate matter from the sample gas. The system further comprises an NO_2 converter in fluid communication with a first one of the at least one sample gas line downstream of the means for removing particulate matter, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas to convert NO_2 gas in the sample gas to NO gas. The NO_2 converter is disposed in the chamber interior. The system still further comprises means for removing water from the sample gas, the means for removing being disposed adjacent the chamber and being in fluid communication with the at least one sample gas line downstream of the NO_2 converter; and a first analyzer configured for determination of an NO concentration level in the sample gas.

c. Claim 22

Independent claim 22 recites an emissions monitoring system comprising a sampling; a chamber positioned adjacent the stack; a chamber heater adapted for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas; at least one sample gas line at least a portion of which is disposed in the chamber interior; a filter disposed adjacent the stack, the filter being in fluid communication with the at least one sample gas line; an NO_2 converter disposed in the chamber interior in fluid communication with a first one of the at least one sample gas line downstream of the filter, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas to convert NO_2 gas in the sample gas to NO gas; a dryer disposed adjacent the chamber downstream of the NO_2 converter; and at least one

analyzer downstream of the dryer, each of the at least one analyzer being configured for determination of a concentration level of a constituent in the dried filtered sample gas.

d. Claim 25

Independent claim 25 recites a method of monitoring a concentration level of NOx, the method comprising the steps of: capturing sample gas using a sample gas probe; cooling the sample gas to a temperature below about 350 °F but above a dew point temperature of the sample gas; converting NO_2 in the cooled sample gas to NO by passing the sample gas through a catalytic NO_2 converter adapted for operation at temperatures above the dew point temperature of the sample gas; removing water from the sample gas by passing the gas through a dryer downstream of the NO_2 converter; and determining a sample gas NO concentration level.

e. Claim 32

Independent claim 32 recites a method of monitoring a concentration level of NOx, the method comprising the steps of: capturing sample gas using a sample gas probe; cooling the sample gas to a temperature below about 350 °F but above a dew point temperature of the sample gas; removing particulate matter from the cooled sample gas; converting NO_2 in the cooled sample gas to NO by passing the sample gas through a catalytic NO_2 converter while maintaining the temperature of the sample gas above the dew point temperature of the sample gas; cooling the sample gas to a temperature sufficient to cause water in the sample gas to condense out of the sample gas; and determining a sample gas NO concentration level. The step of converting NO_2 precedes the step of cooling the sample gas to a temperature sufficient to cause water in the sample gas to condense out of the sample gas.

f. Claim 33

Independent claim 33 is similar to claim 25 except that it recites a method of monitoring a concentration level of a non-specific constituent rather than NOx. The method of claim 33 comprises capturing, cooling, removing particulate matter, converting NO_2, and removing water steps that are essentially similar to steps in claim 25. The method further comprises: measuring a sample gas flow rate downstream of the dryer; determining a sample gas constituent concentration

level; introducing a span gas having a known span gas constituent concentration level into the sample gas upstream of the catalytic NO_2 converter to form a combined sample and span gas flow; measuring a combined sample and span gas flow rate downstream of the dryer; determining a combined sample and span gas constituent concentration level; and determining an overall system bias using the known span gas constituent concentration level, the sample gas constituent concentration level and the combined sample and span gas constituent concentration level.

2. The Cited References

a. The Heyman Paper

The Heyman Paper presents sample conditioning and analyzer requirements for the determination of NO, NO2, and NO_x using chemiluminescent systems. Heyman Paper Summary, page 213, col. 2. In particular, the Heyman Paper presents a series of requirements for a stack gas NO_x monitoring system comprising (1) a sample conditioning portion and (2) an analyzer portion. A flow diagram of the overall system is presented in Figure 2 on page 211. A schematic of the chemiluminescence analyzer portion is presented in Figure 1 on page 210.

The Heyman Paper states that the principal components of the analyzer portion are a reaction chamber for the NO-ozone reaction, a sensitive photomultiplier tube, a source of ozone, and an NO2-to-NO converter. Heyman Paper, page 21, col. 1.

The sample conditioning system of Figure 2 includes a sample probe, a permeation dryer for removing water vapor, a filter for removal of particulates, and a heated pump for delivering the sample gas to the analyzer. Heyman Paper, page 211, col. 1. Figure 2 shows these components within a box identified as "Enclosure Maintained Above Sample Dewpoint Temperature." Heyman notes that refrigeration condensers may be used in place of the permeation dryer but cautions that "these will remove all NO_2 present." Id. The sample conditioning system also includes means for introducing calibration gas. Id.

Figure 3 illustrates an exemplary enclosed sample conditioning system, which can be mounted on the stack. Heyman notes that although the sample system is normally designed for

location at the stack, it can be provided with a temperature-controlled heat-traced line "for location adjacent to analyzer, when location at stack is not feasible." Heyman Paper, page 211, col. 2.

b. The Yokoyama Paper

The Yokoyama Paper, as best understood from the English language abstracts provided by the Examiner, presents a method of determining NO_x concentration in exhaust gases using a chemiluminescent analyzer. According to the first abstract, this method includes "letting the gas flow through an NO2-to-NO converter at the sampling point," apparently followed by determining the NO_x concentration. Yokoyama Paper, Abstract 1. The method also includes "letting the gas flow through an NO_2 absorber, also provided at the sampling point," apparently followed by determining the NO_x concentration. Yokoyama Paper, Abstract 1. According to the second abstract, flue gas is "contacted at the sampling port with activated C at 240-300° to reduce NO_2 to NO, thus avoiding errors due to absorption of NO_2 by water condensed in the sampling line and the eliminator." Yokoyama Paper, Abstract 2.

An activated carbon fixed bed type reactor is said to be satisfactory as the NO2-to-NO converter. Yokoyama Paper, Abstract 1.

c. The Yamaki Patent

The Yamaki Patent is directed to a process for converting nitrogen dioxide into nitrogen monoxide that comprises bringing a gas containing nitrogen dioxide into contact at a temperature ranging from 50-400°C with a carbide of a metal selected from the group consisting of chromium, molybdenum, tungsten, vanadium, titanium, tantalum, silicon and boron or a composite carbide of such metals, thereby reducing the nitrogen dioxide contained in the gas to nitrogen monoxide. Yamaki Abstract.

The Yamaki patent discloses the use of an NO_2 to NO converter as part of nitrogen oxide measurement using chemiluminescence. Yamaki Patent, Col. 1, lines 15-36. The Yamaki further discloses that such a converter typically uses a mixture of molybdenum oxide and carbon as a reducing agent. Id. this type of converter is said to be effective only at temperatures in the range of 350-450°C. Id.

The carbides of the Yamaki invention are said to convert NO_2 to NO by reaction at temperatures in the range of 100-350°C. Yamaki Patent, col. 2, lines 27-31.

d. The Hara Application

The Hara Application is directed to a catalyst for converting NO_2 to NO. The information in the abstract is substantially as presented by the Examiner in the Office Action and is confined to a list of the materials and method steps for preparing the catalyst. There is no discussion of the use of the catalyst in a converter device or as a part of a chemiluminescent analysis methodology.

e. The Jacquot Paper and Burrows Patent

The Jacquot and Burrows references were discussed in detail in responses previously submitted by the Applicants.

3. The Features of System Claims 1, 22 and 25 Are Not Taught, Disclosed or Suggested by the Cited Combination of References

The Applicant respectfully submits that the combined teachings of the cited prior art references do not teach, disclose or suggest the features of independent claims 1, 12 and 22. Each of these claims recites an emissions monitoring system that comprises a chamber positioned adjacent an exhaust stack and a heater or means for maintaining the temperature in the stack above the dew point of the sample gas. Each of these claims also recites that a filter (or means for removing particles) and an NO_2 converter are disposed within the chamber and a dryer (or means for removing water) downstream of and adjacent the chamber.

The cited references do not disclose or suggest the above features. As discussed in detail above, the Heyman Paper discloses a sampling system in which a filter and a permeation dryer are disposed within an enclosure that is maintained above the dewpoint temperature of the sample gas. The sample system filters and dries the sample for delivery to an analyzer which includes an NO_2 converter. While the enclosed sample system may be mounted at the stack, the analyzer (including the converter) is not. The Heyman Paper does not teach, disclose or suggest that the NO_2 converter be included as part of the sampling system at the stack and clearly does not disclose or suggest that the converter be disposed in the temperature-controlled enclosure.

Based on the above, it is clear that the Heyman Paper does not disclose or suggest the features of claims 1, 22 and 25. The Applicants submit that the missing features are not supplied by the other references cited by the Examiner. The most significant of these references is the Yokoyama Paper, which teaches that an NO_2 converter may be positioned at the sampling point so as to minimize the error introduced by the absorption of NO_2 in water condensed out in the sampling tube. The Yokoyama Paper, however, does not disclose or suggest placing the converter apart from the sampling point in a heated chamber.

In each of claims 1, 22 and 25, the converter is disposed downstream of a filter in a heated chamber that is adjacent the stack. Neither the Heyman Paper nor the Yokoyama Paper disclose this configuration.

It was asserted in the Office Action that it would have been obvious to one of ordinary skill in the art to place the converter of Heyman in the sample conditioning system prior to the drier because "as taught by Yokoyama the positioning of the converter at the sampling position reduces errors . . . due to the removal of NO_2 in the drying process." The Applicants respectfully submit that while Yokoyama can be taken to suggest the advantages of converter placement at the sample point, it does not suggest, in any way, the placement of the converter within a temperature-controlled enclosure.

The remaining references identified by the Examiner appear to have been cited due to their relationships to the dependent claims. None of these references includes any disclosure of the significance of the positioning of an NO_2 converter in a monitoring system as recited in claims 1, 12 and 22.

For at least the above reasons, the Applicants respectfully submit that the combined teachings of the cited references do not teach, disclose or suggest the features of claims 1, 12 and 22. The Applicants therefore request that the rejection of claims 1, 12 and 22 and dependent claims 2-11, 13-19, 21, 23, and 24 under 35 U.S.C. 103(b) be withdrawn.

4. The Features of System Claims 25, 32 and 33 Are Not Taught, Disclosed or Suggested by the Cited Combination of References

Method claims 25, 32 and 33 all recite methods of monitoring a concentration of NO_x (or, in the case of claim 32, a non-specified constituent) in an exhaust stream. Each of these claims recites cooling the sample gas to a temperature below 350°F but above a dew point temperature of the sample gas, converting NO_2 in the cooled sample gas by passing the gas through a catalytic NO_2 converter, and subsequently cooling the sample gas to a temperature to cause water in the sample gas to condense out of the gas.

None of the cited references disclose a method having all of these steps. In particular, none of the cited references discloses cooling the sample gas to a temperature below 350°F but above a dew point temperature of the sample gas prior to passage of the gas through a converter. At least two of the references (the Yamaki Paper and the Hara Application) disclose the use of a converter at temperatures in excess of 350°F, but neither discloses a cooling step prior to conversion.

In addition, none of the cited references discloses a method in which the sample gas is passed through a dryer after passage through an NO_2 converter.

For at least the above reasons, the Applicants respectfully submit that the combined teachings of the cited references do not teach, disclose or suggest the features of claims 25, 32, and 33. The Applicants therefore request that the rejection of claims 25, 32 and 33 and dependent claims 26, 27, 29-31 and 34 under 35 U.S.C. 103(b) be withdrawn.

II. CONCLUSION

For at least the reasons set forth above, the Applicants respectfully submit that claims 1-19, 21-27 and 29-34 are in condition for allowance. The Applicants therefore request that the present application be allowed and passed to issue.

Should the Examiner believe anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact the Applicants' undersigned representative.

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